

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A resonance frequency detecting device of a multi-shaft electric motor control apparatus comprising an electric motor control system provided with each of a plurality of shaft of a machine, the electric motor control system having:

an electric motor for driving one of the plurality of shafts of a machine; and

a controller for driving the electric motor upon receipt of a control command for each of the shafts,

~~wherein the electric motor control system includes:~~

a detector for detecting an operating amount of the machine;

a signal processor for analyzing a frequency of a signal of the detector and outputting the frequency as a resonance frequency; and

an output device for changing a signal of the signal processor into a graph or a numeric value to be output,

~~characterized in that~~wherein at least one command generator for giving the control command for transmitting a vibration to the machine to at least one of the electric motor control systems is provided to input signals of the detectors to the signal processors and to output them as resonance frequencies.

2. (original): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1, wherein the signal processor inputs the signals of the detectors and outputs a sum of the signals as a resonance frequency.

3. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~or 2~~, wherein the detector to detects a position or speed of the electric motor, or a position or speed of a movable portion of the machine.

4. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 3~~, wherein in the case in which a part or all of the electric motor control systems is an open loop, a signal of the command generator is input to the controller of the electric motor control system of the open loop.

5. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 3~~, further comprising:

a closed loop controller for giving the controller a control command corresponding to a deviation between a control command sent from the command generator and the operating amount of the machine which is sent from the detector in a part or all of the electric motor control systems.

6. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 3~~, further comprising:

a closed loop controller for outputting a control command corresponding to a deviation between the operating amount of the machine which is sent from the detector and an operation command; and

a filter processing portion for reducing a signal in a predetermined band included in the control command in a part or all of the electric motor control systems,

wherein a sum of an output of the filter processing portion and a command signal sent from the command generator are input to the controller.

7. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 6~~, wherein the control command is a sweep sine wave signal, and

the signal processor inputs a frequency information of the sweep sine wave signal output from the command generator and a signal of at least one of the detectors, and outputs a frequency of the sine wave signal at which an absolute value of the signal of the detector is maximized as a resonance frequency.

8. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 7~~, wherein the output device outputs a signal of at least one of the signal processors as a frequency characteristic.

9. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 8~~, wherein a control command for transmitting a vibration from the command generator to a machine has a frequency limited to a range from a minimum frequency F_{min} to a maximum frequency F_{max} , and

the signal processor limits a signal of the detector to a predetermined frequency range and inputs the signal, and detects only a frequency which is equal to or higher than the minimum frequency F_{min} .

10. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 8~~, wherein a control command for transmitting a vibration from the command generator to the machine has a frequency limited to a range from a minimum frequency F_{min} to a maximum frequency F_{max} , and

the signal processor limits a signal of the detector to a predetermined frequency range and inputs the signal, and detects only a frequency which is higher than the minimum frequency F_{min} and is equal to or higher than a detected minimum frequency F_{lim} .

11. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 10~~, wherein a high-pass filter is provided between the detector and the signal processor.

12. (currently amended): The resonance frequency detecting device of a multi-shaft electric motor control apparatus according to claim 1 ~~any of claims 1 to 11~~, wherein a switch for inputting a signal of the detector for one of the shafts to signal processors for another shaft is provided.